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(54) Resonance absorber for rail wheel

(57) A resonance absorber includes at least one spring tongue 2 secured at its fixed end 2*a* to a base 1 and carrying at its other, free end 2*b* a mass 5. The tongue 2 is separated from the base 1 and supported by an intermediate layer 6 of damping material (e.g. rubber) which extends only partway along the length of the tongue 2 between its two said ends 2*a*, 2*b*. By changing the size and position of both or either of the layer 6 and the mass 5, the tongue 2 can be tuned to the basic oscillation frequency and first upper oscillation of a wheel to be damped. The low height of the absorber allows it to be fixed to the tyre of a rubber suspended rail wheel.

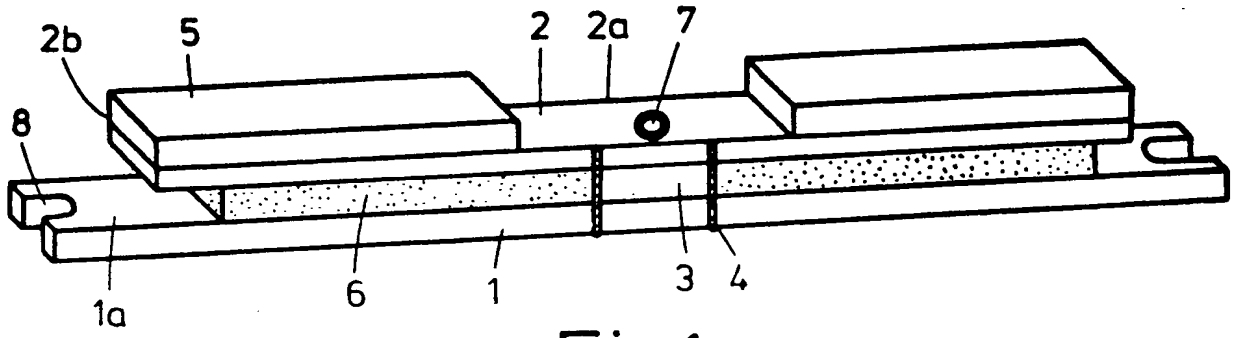

Fig.1

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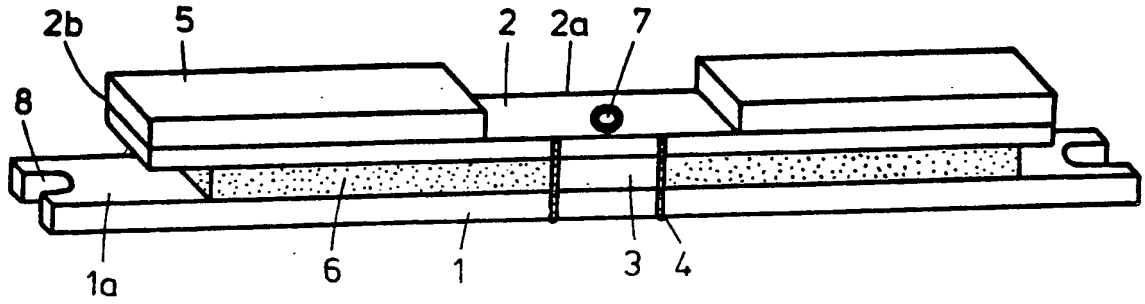

Fig.1

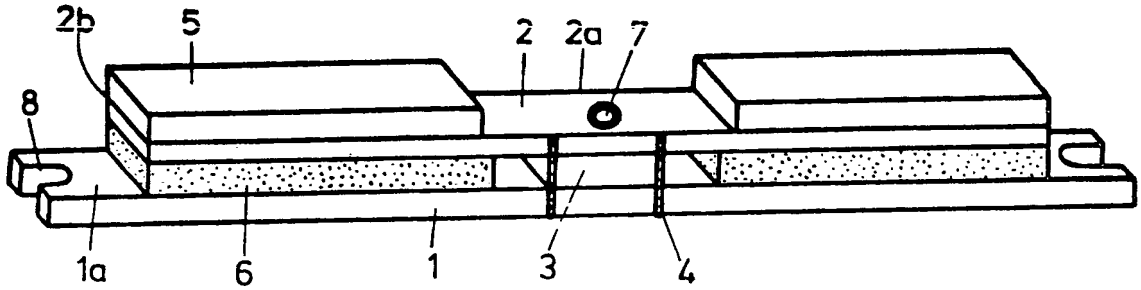

Fig.2

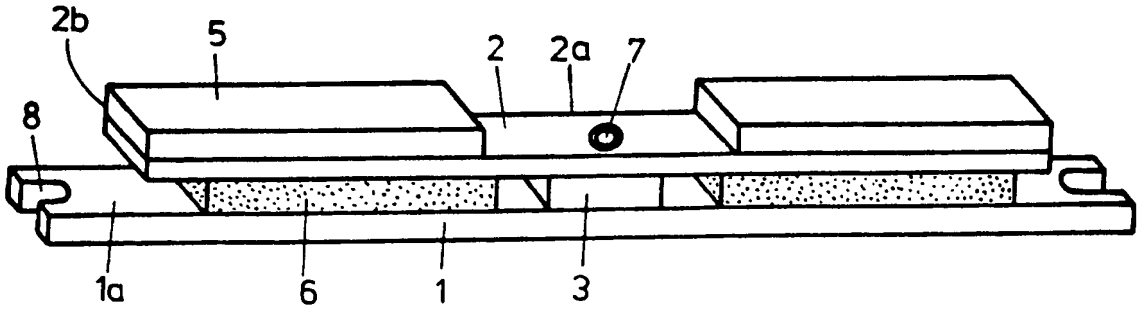

Fig.3

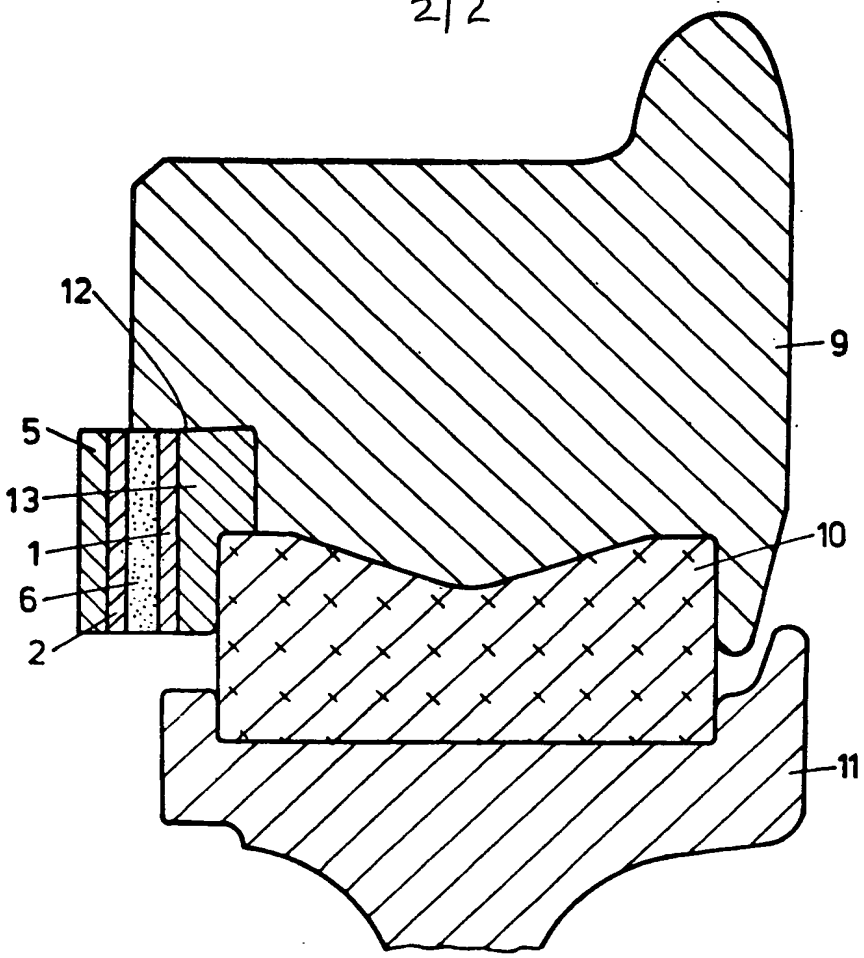

Fig. 4

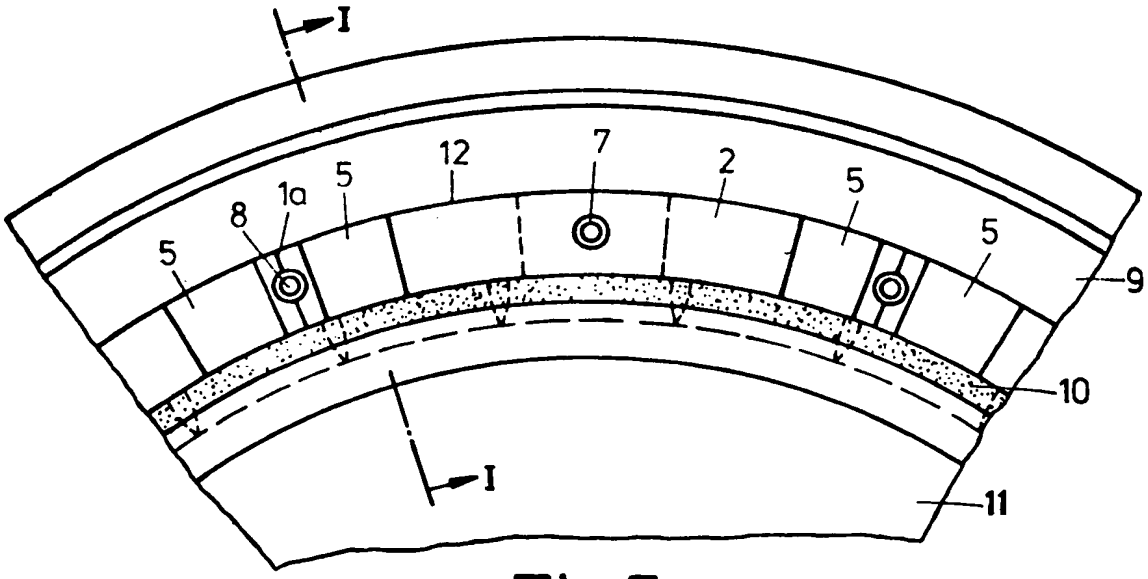

Fig.5

SPECIFICATION

Resonance absorber and wheel fitted therewith

The present invention relates to a resonance absorber of mass and damping material and to a wheel fitted therewith.

Such resonance absorbers are, for example, used in rail wheels in order to damp the different types of noises. Tests with a ring composed of damping material attached to the wheel ring and designed to damp the axial oscillations responsible for screeching noise have not produced satisfactory results (German Offenlegungsschrift 1,605,065).

In another test, conducted by the present Applicant, to damp the running noises by means of inserting damping bodies in annular grooves on the wheel ring or ring body parts composed of individual small plates, circular ring sections or ring discs and coated on their support surfaces with a lubricant-type working material of a high viscosity, no satisfactory result could be obtained and therefore such a resonance absorber could not find use in practice.

In the case of another known rail wheel resonance absorbers are fixed on the wheel disc adjacent the wheel ring. Each resonance absorber comprises a cylindrical rubber buffer, on the front surface of which two metal discs are moulded on with inserted screwbolts. However, it has been found that the effectiveness of the damping in this damped rail wheel, which has been tried out in practice was already substantially decreased after the relatively short time of operation of one year. For this reason, such damped rail wheel has also not been widely adopted in practice (VDI Journal, vol. 96, No. 6, 21.2.54, pages 171–175).

Conversely, a resonance absorber which is the subject of a previous patent application has given good results in the damping of noise. This resonance absorber comprises several tongues separated from one another by means of intermediate layers of damping material and tuned to the various natural frequencies of the wheel. The disadvantage of such a resonance absorber is that each frequency must have its own respective tongue. This not only entails additional constructional expense but also increases the constructional height. Such a resonance absorber cannot be used universally on account of this specific constructional height which cannot be reduced for constructional reasons. For example, rubber suspended rail wheels, in which te resonance absorbers are to be attached to the wheel tyre supported on a rubber insert, require resonance absorbers of minimal constructional height, as otherwise either the resonance absorbers would project too far or, when the wheel tyre is built into recesses, the wheel tyre would be weakened to too great an extent by the recesses.

It is particularly important to damp the development of noise when travelling around curves. Here the rail wheels are excited to axial osciallations in their basic frequency and/or their first upper frequency. Upper frequencies of a higher range practically do not occur due to the high excitation energy necessary.

An object of the present invention is to provide a resonance absorber which can have a low constructional height and which can oscillate intensively in two resonance frequencies—a basic frequency and a first upper frequency—whereby these two oscillations can be tuned to, for example, the two wheel frequencies to be damped, which cause screeching on curves.

According to a first aspect of the present invention there is provided a resonance absorber including at least one spring-tensile tongue secured at its fixed end to a base and carrying at its other free end an additional mass, the or each tongue being separated from the base along at least part of its length between its two said ends and supported by an intermediate layer of damping material which extends only partway along the length of the tongue between its two said ends.

For convenience the resonance absorber preferably includes two tongues joined together at their respective fixed ends and secured to a common base. A single tongue can however function satisfactorily.

Such a resonance absorber can not only oscillate in the basic oscillation but also in the first upper oscillation at a high intensity. It can be turned to a basic oscillation and the first upper oscillation of a wheel or other article to be damped according to the dimensions of, mainly, the additional mass and the partial length of the tongue supported by the layer of damping material. The tuning can of course also be influenced by other factors such as the dimensions and the material of the tongue and of the damping material. Since only a single tongue need be necessary to damp the basic oscillation and the first upper oscillation, which are those mainly responsible for the production of noise by an article, the constructional height of such a resonance absorber can be comparatively low.

According to a second aspect of the present invention there is provided a wheel having a plurality of resonance absorbers distributed around its periphery wherein each absorber is according to the first aspect of the present invention. The resonance absorbers are preferably distributed over the wheel body in particular in its outer area, e.g. on the wheel ring, tyre or rim. The resonance absorbers in a rubber suspended rail wheel are preferably fixed, e.g. by screwed connections to a ring or rings, which are shrunk into a recess or re-

cesses of the wheel tyre supported on a rubber insert. To remove or reduce the axial oscillations responsible for screeching noise, the tongues are arranged to lie in the plane containing the radial and tangential vectors so that they can oscillate in an axial direction. To remove or reduce the radial oscillations, which are responsible for running noise, the tongues are arranged to lie in a plane containing the radial and axial vectors so that they can oscillate in a radial direction. Resonance absorbers for the obliteration of radial and axial oscillations can be arranged on the ring alternately or, alternatively, resonance absorbers with preferred orientation for the obliteration of radial and axial oscillations can be arranged on both sides.

Embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings, wherein:—

Figure 1 shows a first embodiment of resonance absorber;

Figure 2 is a view of a second embodiment of resonance absorber;

Figure 3 illustrates a third embodiment of resonance absorber; and

Figures 4 and 5 show a circumferential portion of a rail wheel fitted with resonance absorbers, Fig. 5 being in side view and Fig. 4 being a radial cross-section along the line I–I in Fig. 5.

Referring firstly to Fig. 1 the embodiment illustrated includes two resonance absorbers which are combined to form a joint body. The two resonance absorbers are jointly clamped at one end. They have a base 1 composed of steel sheet material. Each resonance absorber further comprises a tongue 2 composed of spring-tensile sheet material such as steel or aluminium. At one end 2*a* the tongue 2 is connected to the base 1 with interposition of an intermediate layer of a spacer plate 3. The connection can for example be welding beads 4 drawn over the edges. At its other free end 2*b* the tongue 2 carries an additional mass 5. An insert 6 of damping material such as silicon caoutchouc (or India rubber) is positioned between the tongue 2 and the base 1 along a part of the length of the tongue 2 extending between the clamped end 2*a* and the free end 2*b*. For securing purposes, the resonance absorber has a bore 7 in the area of the spacer plate 3 and a recess 8 on a lug 1*a* of the base 1, each being for a screwbolt.

Referring now to Figs. 2 and 3, in which like parts have like reference numerals as in Fig. 1, in the embodiment of Fig. 2 in contrast to the embodiment of Fig. 1 the insert 6 of damping material does not start directly from the clamped end 2*a* but there is a free space between the clamped end 2*a* and the beginning of the insert 6. Moreover, the insert 6 ends at the tongue end 2*b*. The embodiment of Fig. 3 differs from that of Fig. 2 in that the insert 6 of damping material ends before it reaches the tongue end 2*b* as is the case in the embodiment of Fig. 1, but like the embodiment of Fig. 2 is spaced from the end 2*a*. In each embodiment by changing the length and position of the damping material 6 supporting the tongue 2 and by altering the size and position of the additional mass 5 the tongue 2 can be tuned to the basic oscillation and to the first upper oscillation to be damped in the article to which the absorber is or will be attached.

Referring now to Figs. 4 and 5 the rail wheel has a wheel tyre 9 supported on its wheel rim 11 by a rubber suspended insert 10 composed of individual, highly prestressed rubber blocks. A recess 12 is provided on the front side of the wheel tyre 9 into which a ring 13 is shrunk. Resonance absorbers are screwed onto the ring 13. The resonance absorbers are distributed in a circumferential direction so that neighbouring lugs 1*a* meet and adjacent recesses 8 can jointly receive the fixture bolts. The resonance absorbers are curved to follow the geometry of the wheel and lie in a plane so that they preferably obliterate the axial oscillations.

CLAIMS

1. Resonance absorber including at least one spring-tensile tongue secured at its fixed end to a base and carrying at its other, free end an additional mass, the or each tongue being separated from the base along at least part of its length between its two said ends and supported by an intermediate layer of damping material which extends only partway along the length of the tongue between its two said ends.

2. Resonance absorber according to claim 1 including two tongues joined together at their respective fixed ends and secured to a common base.

3. Resonance absorber substantially as herein described with reference to any one of Figs. 1 to 3 of the accompanying drawings.

4. A wheel having a plurality of resonance absorbers distributed around its periphery wherein each absorber is according to any one of claims 1 to 3.

5. A wheel according to claim 4 wherein the resonance absorbers are distributed on a ring, tyre or rim of the wheel.

6. A wheel according to claim 4 or claim 5 wherein the wheel is a rubber suspended rail wheel having a wheel tyre supported on a rubber insert and the resonance absorbers are connected to a ring or rings shrunk into a recess or recesses in the wheel tyre.

7. A wheel according to claim 6 wherein the resonance absorbers are connected to the ring or rings by screw connections.

8. A wheel substantially as herein described with reference to Figs. 4 and 5 of the accompanying drawings.

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